Mark IV-85 Mission Support Planning and Future Mission Set

R. J. Amorose
TDA Mission Support and DSN Operations

The DSN is currently involved with supporting a group of mature deep space missions, none of which has been launched in the past ten years. With great anticipation, the DSN is looking forward to the return of the Space Transportation System, which is scheduled to launch four deep space missions in 1989 through 1992. The DSN also supports earth orbiting spacecraft that are not compatible with the Tracking and Data Relay Satellite System (TDRSS).

I. Introduction

DSN Mission Support Planning is based on the total mission set and critical events listed in Figs. 1, 2, 3, and 4. A group of older missions, including the Pioneers, the International Cometary Explorer, and the Voyagers, are being tracked daily by the deep space antennas located near Goldstone, California, Canberra, Australia, and Madrid, Spain. While all of these missions have periods of important science return along with their normal interplanetary science data acquisition, the Voyager 2 spacecraft has one last significant planetary encounter.

The Voyager Neptune encounter will be supported by the DSN from June through September of 1988, with the closest approach to Neptune on August 25, 1989. All three DSN Complexes plus the National Science Foundation's Very Large Array (VLA) in Socorro, New Mexico, the Parkes Radio Telescope in Parkes, Australia, and the Japanese Usuda station will be used for data collection during this encounter period. The telecommunications link performance at the Neptune distance from earth requires the DSN to augment its capabilities in order to support the planned Voyager data rates (21.6-kbps maximum). Each of the DSN's 64-meter antennas has been upgraded to 70 meters. The VLA has been equipped with X-band receive capability; the Parkes 64-meter antenna is being equipped with X-band receive capability and radio science ground support equipment; and the Usuda 64-meter antenna is being equipped with an S-band low-noise amplifier and radio science ground equipment.

The VLA (27-antenna configuration) and the Goldstone 70-meter and 34-meter antennas will be arrayed to provide the project telemetry data; Parkes will be arrayed with the Canberra 70-meter and 34-meter antennas to provide the project telemetry data; and a non-real-time array of Parkes and the Canberra 70-meter antenna will provide X-band radio science data. Usuda and the Canberra 70-meter antenna will provide S-band radio science data for a non-real-time array. This multi-agency, multi-nation mission support plan has been several years in development and is currently in the implementation and test phase. The DSN Operational Readiness date of March 7, 1989, will bring all these elements together (the

Parkes date is March 20) to support Voyager project pre-encounter test and training.

II. Future Missions

The DSN is looking forward to five new deep space missions beginning with Magellan, which is scheduled to launch in April 1989. This will be followed closely by the previously mentioned Voyager encounter. After a short break following the encounter, the DSN will begin supporting the Galileo mission, scheduled for launch in October 1989. While all of this NASA Deep Space Mission support is occurring, the DSN will be supporting the Soviet Phobos mission. In conjunction with two orbiters and two lander spacecraft, the DSN 70-meter subnetwork will support the Phobos Mission for about 1 year after the first landing, scheduled for April 7, 1989. The second landing is scheduled for May 25, 1989. The fourth mission is the European Space Agency's Ulysses mission for which JPL provides the Mission Control function, and which is a NASA/ESA cooperative mission. The launch is scheduled for October of 1990. Then, in August of 1992, the Mars Observer is scheduled for launch. This will be the first all-X-band mission for the Deep Space Network.

The DSN also has a 26-meter earth orbiter tracking subnetwork that supports non-TDRSS-compatible spacecraft. This subnet is currently involved in supporting an extended mission set consisting of Nimbus-7, Dynamic Explorer-1, and Solar Maximum Mission.

When the space shuttle returns to flight, the 26-meter subnetwork will provide prime support from Goldstone and emergency support from Canberra and Madrid.

The major future work of this subnet will be the International Solar Terrestrial Program (ISTP). This multi-spacecraft program is scheduled for three launches in 1992 (Geotail, Wind, and Polar) and several more in 1995 (Soho and Cluster).

Additional work for the 26-meter subnetwork consists of providing, on a reimbursable basis, launch and drift orbit support of geosynchronous orbit spacecraft from Japan, France, and Germany (see Fig. 3).

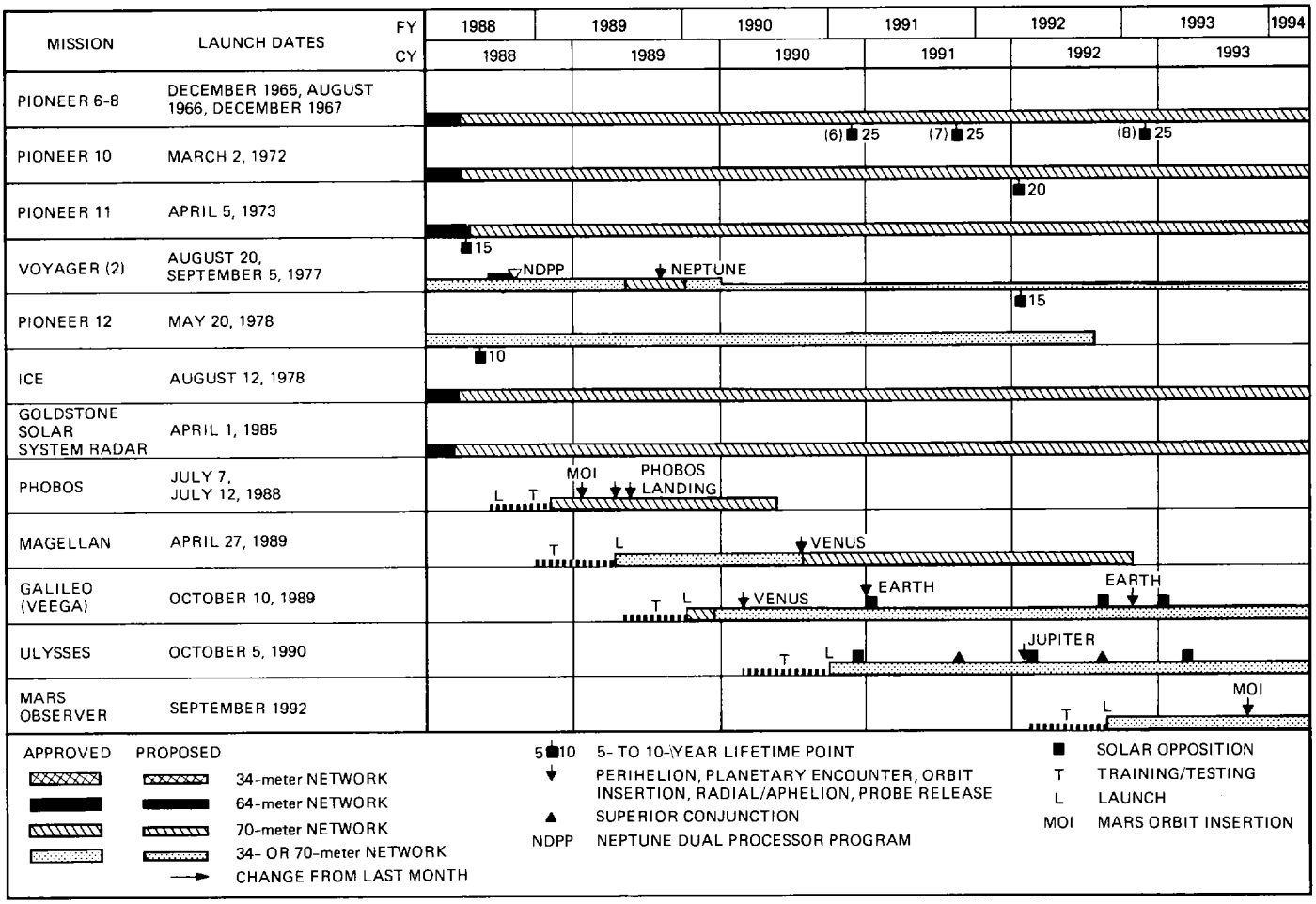

Fig. 1. Deep space missions

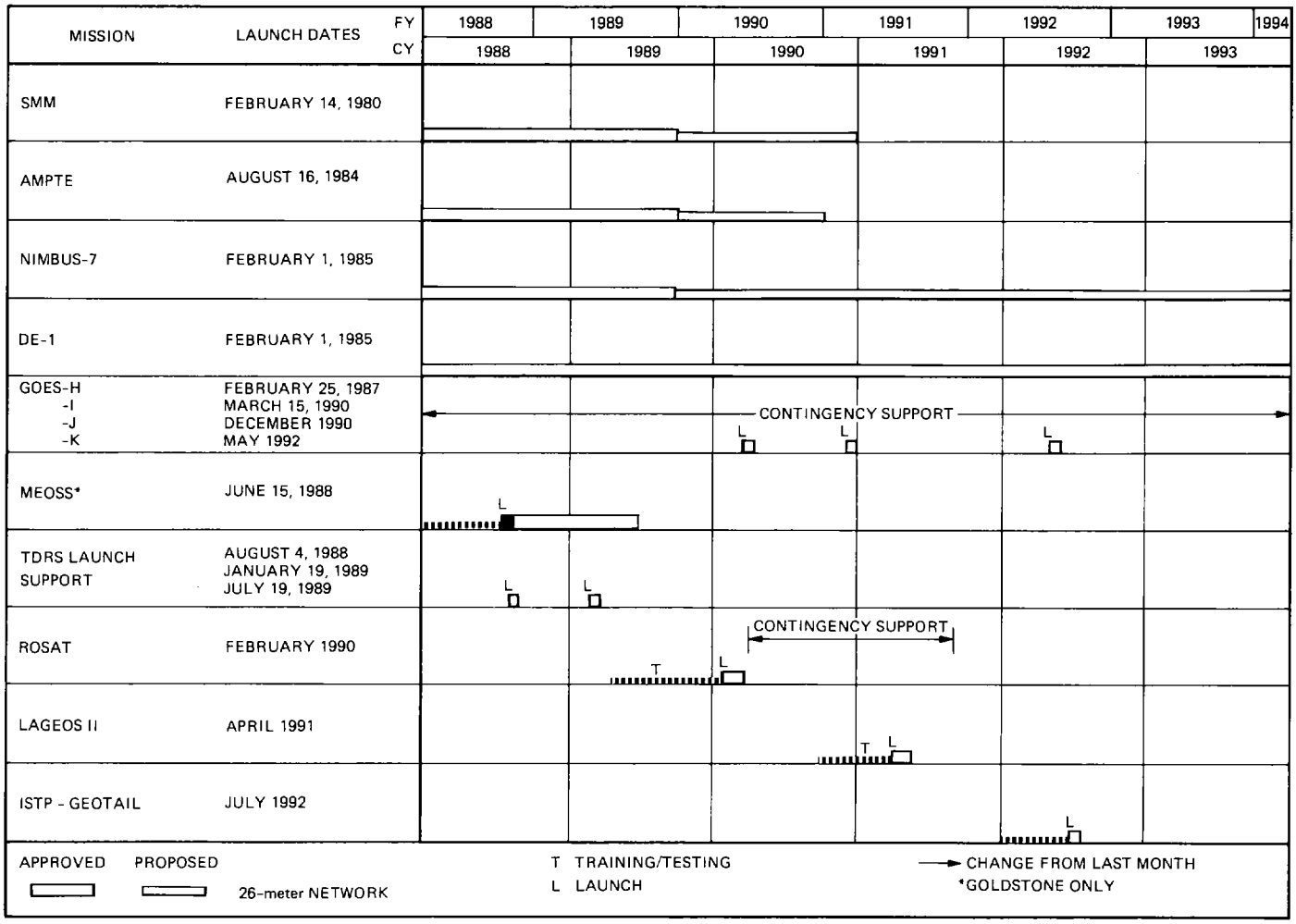

Fig. 2. Earth orbiter missions

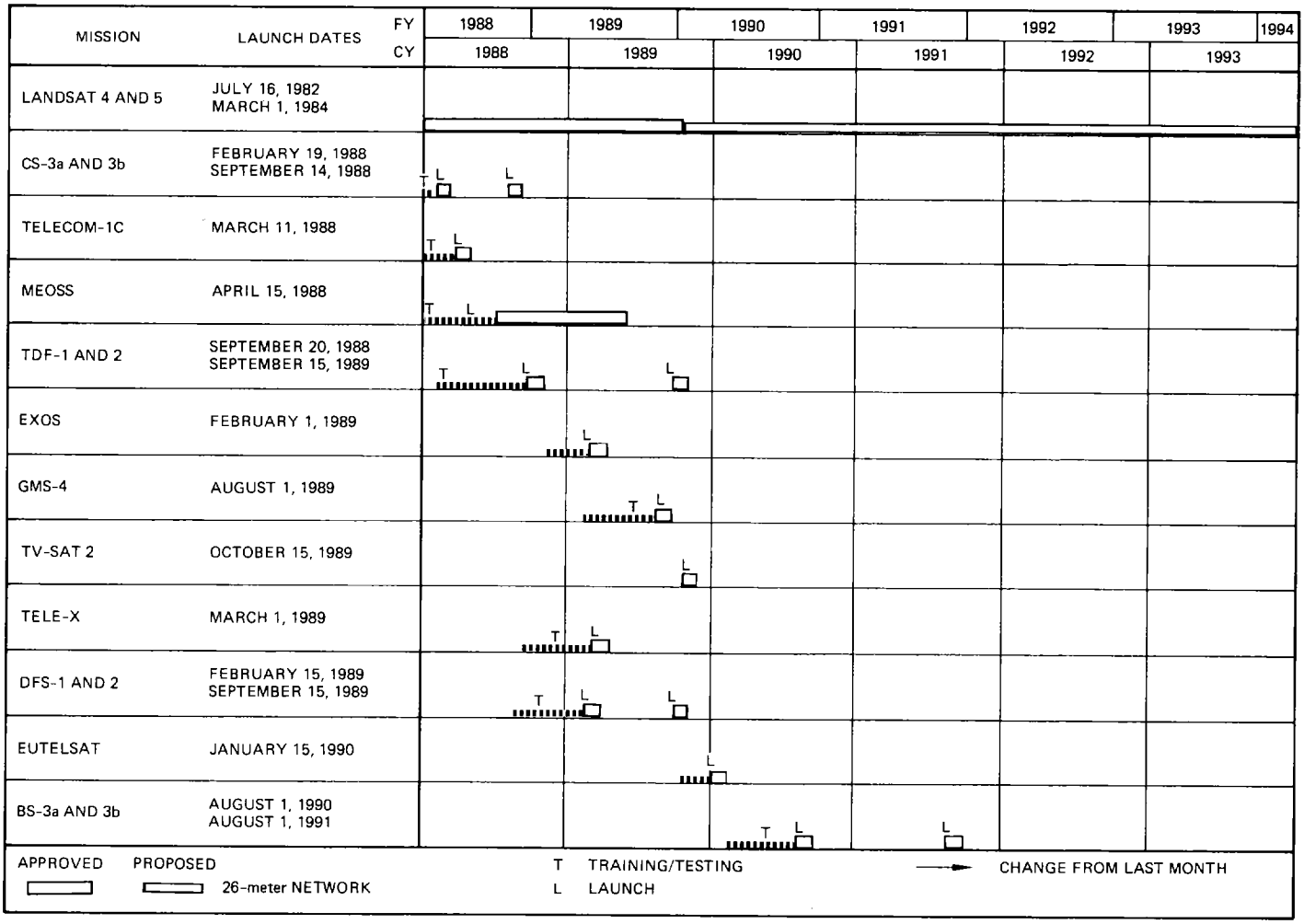

Fig. 3. Reimbursable missions

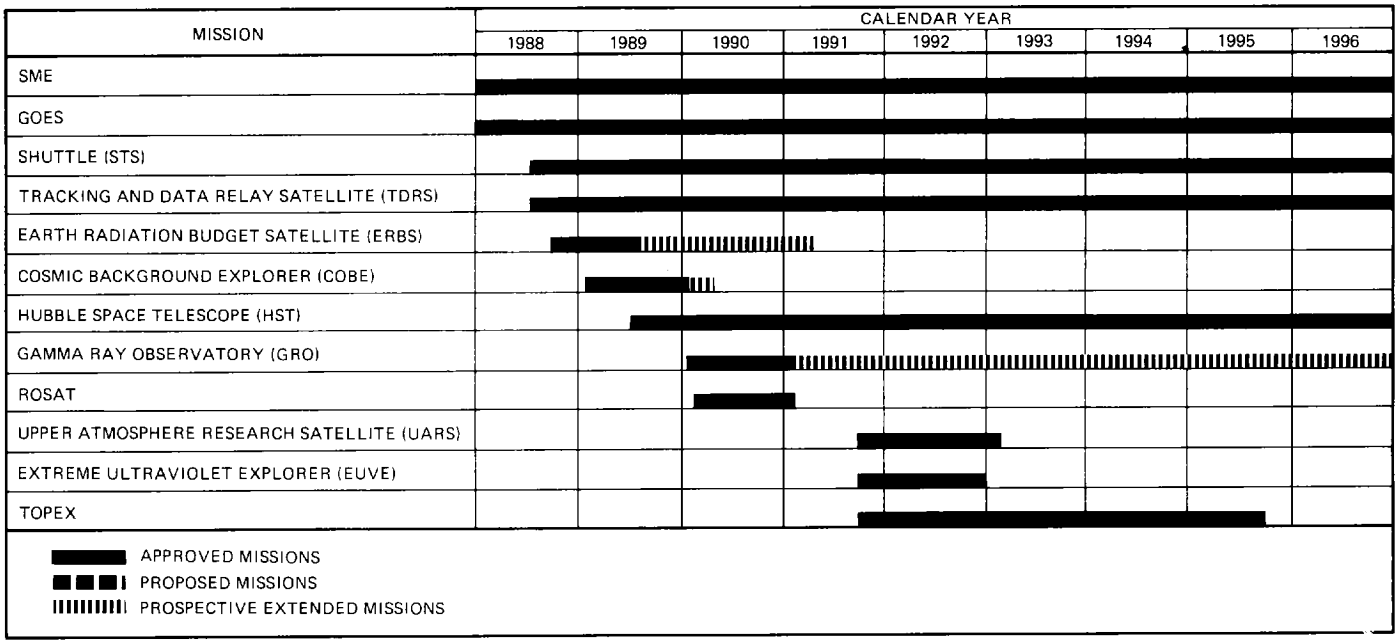

Fig. 4. Emergency support missions